REMARKS

Reconsideration of this application is requested.

Upon entry of the attached amendment, claims 1-12 will be pending in this application for the Examiner's review and consideration. Claim 1 has been amended in accordance with the Examiner's suggestion in paragraph 4, page 2 of the Office Action. More specifically, claim 1 has been amended to recite that $0.2 \leq x \leq$ [[1.0]] 0.9. New claim 12 has been added to depend from claim 1 and recite that $0.3 \leq x \leq 0.8$. Support can be found, for example, on page 5, line 2 of the specification. No new matter has been added.

Claim Rejections Under 35 U.S.C. § 112, Second Paragraph

Claims 1-5 were rejected under 35 U.S.C. § 112, second paragraph as indefinite for the reasons discussed on page 2 of the Office Action. In short, the Examiner has noted that since x+y+z=1, and since y is required to have a non zero value, x cannot have a value of 1. In accordance with the Examiner's suggestion, applicants have amended claim 1 to recite that x has an upper limit of 0.9, not 1.0. More specifically, claim 1 has been amended to recite that $0.2 \leq x \leq 0.9$. Applicants have also added new claim 12, which depends from claim 1 and recites that $0.3 \leq x \leq 0.8$.

Claim Rejections Under 35 U.S.C. § 102(b)

Claims 6-10 were rejected under 35 U.S.C. § 102(b) as anticipated by or, in the alternative, under 35 U.S.C. § 103 as obvious over U.S. Patent Publication No. 2001/0002048 to Koike *et al.* ("Koike") for the reasons discussed on page 3 of the Office Action. Applicants respectfully request reconsideration for the reasons that follow.

The present invention relates to a nitride or oxynitride thermoelectric material which has a low electrical resistivity (of nitride) and a high absolute value of a Seebeck coefficient such that it can be employed as a thermoelectric element in thermoelectric conversion. The nitride thermoelectric material has an element composition represented by formula (B): $Al_zGa_yIn_xM_uR_vD_wN_m$,

wherein M represents a transition element; R represents a rare earth element;
D represents at least one element selected from elements of the Group IV or II;
$0 \leq z \leq 0.7$, $0 \leq y \leq 0.7$, $0.3 \leq x \leq 0.8$, $0 \leq u \leq 0.7$, $0 \leq v \leq 0.05$, $0 \leq w \leq 0.2$, and $0.9 \leq m \leq 1.1$; and $x+y+z = 1$. The composition has a non-amorphous structure.

The invention of Koike relates to the technology of forming a single crystal nitride thin film, the most important use of which is in a nitride optical device on a silicon or sapphire substrate. Koike teaches that even in the case of a substrate having a mismatched lattice constant, it is possible to grow the objective single crystal buffer layer by introducing the mismatching relaxation layer. Furthermore, Koike teaches that $Al_xGa_yIn_zN$ materials having various compositions can be utilized as the buffer layer or the mismatching layer.

Particularly with reference to the description in paragraphs [0207] and [0186], Koike teaches that a thin film having an amorphous or crystalline structure, such as a microcrystal-containing amorphous structure, is firstly formed and a single crystal layer is subsequently formed. Koike further teaches that this composite layer can be utilized as a mismatching relaxation layer for the growth of a single crystal buffer layer. Importantly, the mismatching relaxation layer of Koike necessarily contains an amorphous structure, which differs from the composition of the present invention which has a non-amorphous structure. Although the compositional range of the present invention may partially overlap with that of Koike, since the present invention requires a non-amorphous structure, it has a structure which is different from the mismatching relaxation layer of Koike. Moreover, in order to grow a nitride single crystal on a substrate having a different lattice constant, an amorphous structure is necessary. On the contrary, the present invention is not directed to a nitride having a non-amorphous structure.

For at least the above reasons, Koike does not anticipate claim 6 of the present invention. Nor can it anticipate claims 7-10, which depend from claim 6.

Furthermore, Koike does not render obvious claims 6-10 of the present invention, in part because one of ordinary skill in the art upon reading Koike would not have a reasonable expectation of success in obtaining the nitride thermoelectric materials of the claimed invention. One of ordinary skill in the art would understand, for example, that the Seebeck coefficient depends in part on various properties of a material, including its crystal structure. Koike, which as discussed above relates to a technology in a different area than that of the present invention, teaches a mismatching relaxing layer which contains an amorphous structure. This is different than the non-amorphous structure of the composition comprising the materials of the present invention. Therefore, the materials of Koike would not teach or suggest a composition with the specific Seebeck

coefficient and electrical resistivity of those recited in the claimed invention. Accordingly, applicants respectfully submit that Koike does not render obvious claims 6-10 of the present invention.

Claim Rejections Under 35 U.S.C. § 103

Claims 1-5 were rejected under 35 U.S.C. § 103 as obvious over U.S. Patent Publication No. 2004/0108803 to Scholl et al. ("Scholl") for the reasons discussed on page 4 of the Office Action. Applicants respectfully request reconsideration for the reasons that follow.

Scholl relates to a gas discharge lamp with at least one capacitive coupling structure, which is provided for generating an electromagnetic field with a frequency below 50MHz. Scholl teaches general elements and compounds which can be used as dielectric materials. Scholl, however, does not teach the specific elemental compositions or structures for such materials, which is critical to the claimed properties of the present invention—*i.e.*, an oxynitride thermoelectric material which has an absolute value of a Seebeck coefficient of 40 μV/K or more at a temperature of 100°C or more.

Applicants respectfully submit that Scholl does not render obvious claims 1-5 of the present invention for at least the following reasons. Claim 1 recites that the oxynitride thermoelectric material, which has an elemental composition represented by formula (A) above, has an absolute value of a Seebeck coefficient of 40 μV/K or more at a temperature of 100°C or more. The specific oxynitride composition is critical to the invention and indeed results in an oxynitride with the particular Seebeck coefficient property discussed above. As one of ordinary skill in the art would understand, the exact ratios of the elemental components are critical to the compound having the recited Seebeck coefficient property. The present invention is more than just an optimization of the combined elements. This is especially noteworthy given that since the nitride and oxide in Scholl are used as a dielectric layer, the purpose of the invention in Scholl is contrary to that of the present invention in which the electrical resistivity is 10^{-3} Ωm or less (see claim 2). Moreover, the oxynitride thermoelectric material of the claimed invention recites unique and unexpected properties (*i.e.*, having a high Seebeck coefficient and, in claim 2, a low electrical resistivity), particularly in view of Scholl's teachings. And these unexpected properties result in a thermoelectric material with

excellent characteristics, such s a high thermoelectric transforming efficiency. For the above reasons, applicants respectfully submit that claims 1-5 are non-obvious over Scholl.

Reconsideration with allowance is requested.

Respectfully submitted,

MORGAN LEWIS & BOCKIUS LLP

By _____
Mark J. Sullivan
Reg. No. 54,478

Date: February 21, 2008

Customer No. 09629
1111 Pennsylvania Avenue, N.W.
Washington, D.C. 20004
Phone: (202) 739-3000
Facsimile: (202) 739-3001
Direct: (202) 739-5455